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National Institute of Standards and Technology

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National Institute of Standards and Technology

Whether the object is to build a better integrated circuit, a tougher industrial ceramic, or an improved enzyme; whether the goal is greater safety, faster production, or a higher-quality product, accurate measurement is often the end, and always the means. Since its inception as the National Bureau of Standards in 1901, providing

American science and industry with a basis for accurate measurement has been the unique mission of the National Institute of Standards and Technology (NIST).

The science of measurement affects nearly every segment of the U.S. economy. International trade, indeed, almost any exchange of commodities, from a tanker full of oil to a tank full of gas, relies on measurement. The control of manufacturing processes to produce quality goods depends critically on accurate measurement, particularly in those high-technology fields—advanced ceramics, superconductivity, optoelectronics, and biotechnology—that are coming to dominate the economic scene.

For these and other areas of technology, NIST develops the standards, measurement techniques, reference data, test methods, and calibration services that help to ensure national and international measurement capability and compatibility. An agency of the Department of Commerce, NIST has no regulatory powers. Its researchers, however, work closely with

voluntary standards-setting organizations as well as other federal agencies.

With the enactment of the Omnibus Trade and Competitiveness Act in 1988, which gave the agency its modern name, one NIST mission took on additional importance: to aid U.S. companies in adopting new technologies and scientific advances to increase their international competitiveness. Among other things, NIST was given assignments to aid small- and medium-sized companies and consortia through several technology development and transfer programs.

Researchers from industry and universities regularly work in NIST laboratories with Institute experts on projects of mutual interest. For example, engineers, machinists, and computer specialists from private companies, other government agencies, and universities have joined NIST researchers to develop the quality control techniques and the computer software interface standards needed for the automated factory of the future.

To bring automated manufacturing technology to small- and mid-sized manufacturing firms, NIST has begun a manufacturing technology

centers program. The program is designed to establish regional centers that will help these companies improve their technical capabilities and competitiveness.

NIST also has some of the premier research and testing facilities in the United States, several of which are unequaled anywhere in the world. These facilities are available for cooperative or proprietary research. For instance, about 200 scientists use the Institute's 20-megawatt research reactor each year for studies in environmental chemistry, biomedicine, and materials science.

Among other NIST facilities are a synchrotron ultraviolet radiation facility, an automated manufacturing research facility, a large-scale structures test facility, several environmental chambers, a metals-processing laboratory, a fire research facility, a low background infrared facility, and a computer and network security facility.

Operated on an annual budget of about $260 million, the Institute employs a highly skilled staff of some 3,000 at its headquarters in

Gaithersburg, Md., and its site in Boulder, Colo. In Gaithersburg, there are 27 buildings on 579 acres; in Boulder, researchers work in 14 buildings on 205 acres.

For information on conducting cooperative research at NIST, write or call David E. Edgerly, A537 Administration Bldg.,* 301/975-3086.

For general information on Institute programs, write or call the contacts given inside or Peggy Saunders, E128 Administration Bldg., 301/975-3058.

*All addresses are at the National Institute of Standards and Technology, Gaithersburg, MD 20899, unless otherwise noted.

Institute for Materials Science and Engineering

From autos to aerospace, improved materials are changing our lives. Car bodies and airplane parts are being made from polymer composites. Unconventional processing or synthesizing techniques are giving metal, ceramic, and polymer alloys increased strength or unusual properties.

A leader in the materials revolution, IMSE prepares the way for such advances through basic research into materials properties and production processes and development of measurement methods related to materials properties and performance. The results are data, measurement tools, and services for understanding, improving, predicting, and controlling materials performance.

IMSE projects include:

- A high-tech ceramics program geared to help U.S. industry stay competitive in the worldwide race to expand production and application of these materials.
- Exploration and quantification of processing technologies for producing new and improved alloys.
- Cooperative efforts with professional societies to develop phase diagram databases that will help improve processing control and use of metals, ceramics, and polymers.
- Construction of a cold neutron facility at the NIST 20-megawatt research reactor for the study of advanced materials.
- Work with the U.S. metals industry and other federal laboratories to develop and exploit technologies that will improve the quality and reduce the cost of domestic steel, aluminum, and other metals.

Director: Lyle H. Schwartz, B309 Materials Bldg., 301/975-5658.
Office of Nondestructive Evaluation: H. Thomas Yolken, chief, B344 Materials Bldg., 301/975-5727.
Ceramics Division: Stephen M. Hsu, chief, A256 Materials Bldg., 301/975-6119.
Fracture and Deformation Division: Harry I. McHenry, chief, 430.0, NIST, Boulder, CO 80303, 303/497-3251.
Polymers Division: Leslie E. Smith, chief, A305 Polymer Bldg., 301/975-6762.
Metallurgy Division: E. Neville Pugh, chief, B261 Materials Bldg., 301/975-5963.
Reactor Radiation Division: J. Michael Rowe, chief, A106 Reactor Bldg., 301/975-6210.

National Measurement Laboratory

The continued advancement of technology demands increasing measurement accuracy, which in turn requires an ever deepening understanding of the physical world. NML contributes to the international leadership of U.S. scientific research and engineering and to the competitiveness of industrial technology by carrying out research in the physical and chemical sciences and by developing and disseminating measurement methods, standards, and data. NML also coordinates the U.S. measurement system with those of other nations, facilitating international trade.

For example, NML:

- Maintains and improves national standards for mass, length, time, temperature, and electric current.
- Contributes to improved industrial quality control by developing Standard Reference Materials and calibrating equipment and devices.
- Serves as the nation's reference laboratory for the more than 250 million chemical composition measurements made each day in the United States for industrial process control, environmental protection, toxic substances control, and health services.
- Develops advanced measurement techniques for complex physical and chemical systems for use in areas such as chemical manufacturing, waste disposal, biotechnology, and environmental studies.
- Designs dosimeters used to assure accurate measurement of radiation for diagnostic and therapeutic uses, personnel monitoring, and the production of materials.
- Provides reliable technical data required by industry, government, and academia to increase the effectiveness of U.S. science and technology.

Director: Donald R. Johnson, A363 Physics Bldg., 301/975-4500.
Center for Basic Standards: Katharine Gebbie, acting director, B160 Physics Bldg., 301/975-4203.
Center for Radiation Research: Chris E. Kuyatt, director, C229 Radiation Physics Bldg., 301/975-6090.
Center for Chemical Physics: Donald R. Johnson, acting director, A363 Physics Bldg., 301/975-4500.
Center for Analytical Chemistry: Harry S. Hertz, director, A309 Chemistry Bldg., 301/975-3143.
Office of Standard Reference Data: Malcolm Chase, acting director, A323 Physics Bldg., 301/975-2200.
Office of Standard Reference Materials: Stanley D. Rasberry, chief, B311 Chemistry Bldg., 301/975-2012.
Office of Physical Measurement Services: Joe D. Simmons, acting chief, B362 Physics Bldg., 301/975-2005.

National Computer Systems Laboratory

Computer technology has spawned increases in productivity throughout the American economy, contributed to the development of high-technology products and services, and advanced science and engineering research. NCSL, formerly the Institute for Computer Sciences and Technology, serves government and industry by providing standards, test methods, and technical assistance to advance new uses of computer and related telecommunications technology and to spur productivity. NCSL services and research contribute to the development of better products, the growth of markets, and productive applications of computer products and services.

Typically, NCSL:

- Develops cost-effective standards and guidelines for protecting computerized information from threats of all kinds, including operator error, natural disasters, and unauthorized users.
- Helps computer manufacturers, communications companies, and domestic and international standards-writing groups to produce and test standards for off-the-shelf compatibility of computer and related telecommunications systems.
- Works on techniques and tools to help organizations make effective use of computers and information technology, reduce training costs, and improve productivity.

Director: James H. Burrows, B154 Technology Bldg., 301/975-2822.
Information Systems Engineering Division: David K. Jefferson, chief, A266 Technology Bldg., 301/975-3262.
Systems and Software Technology Division: Allen Hankinson, chief, B266 Technology Bldg., 301/975-3290.
Computer Security Division: Stuart W. Katzke, chief, A216 Technology Bldg., 301/975-2934.
Systems and Network Architecture Division: Kevin L. Mills, chief, B217 Technology Bldg., 301/975-3643.
Advanced Systems Division: Shukri Wakid, chief, A224 Technology Bldg., 301/975-2900.

National Engineering Laboratory

From the subtle behavior of microelectronic circuits to the physics of fire, NEL applies expertise in engineering and measurement science to meet the nation's technology needs. Researchers provide state-of-the-art measurement and calibration services in electronics, automated manufacturing, chemical engineering, the behavior and prevention of fires, and the design and construction of buildings. Their work in applied mathematical and computer sciences supports NIST technical programs.

Specifically, NEL:

- Helps the semiconductor industry improve the quality, cost, and reliability of U.S.-manufactured semiconductor devices through new measurement methods and calibration services.
- Assists the U.S. fiber optics industry in achieving international competitiveness by providing the measurement technology for lightwave systems and components used in modern communications.
- Works with flowmeter manufacturers and users to improve the measurement in pipelines of billions of dollars worth of chemicals, petroleum and natural gas products, and other commodities.
- Develops computer-based models and engineering tools that predict fire and its consequences for use by the fire protection and building communities in designing safer buildings.
- Uses a specially designed computerized facility to test how full-scale bridge and building components would perform in earthquakes.
- Provides the measurement science, precision engineering, and computer software vital to the technological advancement of U.S. manufacturing.

Director: John W. Lyons, B119 Technology Bldg., 301/975-2300.
Center for Computing and Applied Mathematics: Francis E. Sullivan, director, A438 Administration Bldg., 301/975-2728.
Center for Electronics and Electrical Engineering: Judson C. French, director, B358 Metrology Bldg., 301/975-2220.
Center for Manufacturing Engineering: John A. Simpson, director, B322 Metrology Bldg., 301/975-3400.
Center for Building Technology: Richard N. Wright, director, B250 Building Research Bldg., 301/975-5900.
Center for Fire Research: Jack E. Snell, director, A247 Polymer Bldg., 301/975-6850.
Center for Chemical Engineering: Jesse Hord, director, 770.0, NIST, Boulder, CO 80303, 303/497-5108.

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